REMARKS

Claims 1-20 are all the claims pending in the application.

Examiner has rejected claims 1-20 as allegedly being unpatentable over U.S. Patent No. 6,031,236 to Arakawa *et al.* ("Arakawa") and further in view of U.S. Patent No. 5,055,681 to Tsuchino *et al.* ("Tsuchino").

Examiner cites Arakawa as disclosing an apparatus and method to prepare a stimulable phosphor sheet, which comprises a support positioned in the deposition system and an evaporation source by which the phosphor layer is evaporated in the vacuum chamber of the deposition apparatus. Tsuchino is cited as disclosing the electron beam vacuum evaporation of a phosphor onto a support that can be heated or cooled before, during, or after the vaporization.

Regarding the alleged obviousness of claim 1, Examiner states that Arakawa discloses a phosphor sheet prepared using the vacuum evaporation method with a relative density more than 70% and preferably up to 93%.

Regarding the alleged obviousness of claims 4, 6, 7, 11, 13, and 20, Examiner concedes that Arakawa fails to specifically use an electron beam heating method for the process of evaporation. Examiner, however, states that Tsuchino discloses the use of an electron beam and vacuum evaporation to form a phosphor layer onto the support, which can be heated or cooled before, during, or after the vaporization. Examiner asserts that the use of an electron beam to vaporize phosphor is well known and thus the step of heating the support layer method constitutes only a matter of design choice.

Regarding the alleged obviousness of claim 9, Examiner asserts that the claimed cooling rate and accelerating voltage constitutes a matter of design choice only. Examiner points out that

where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *See In re Aller*, 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955).

Regarding the alleged obviousness of claim 15, Examiner states that Arakawa discloses that the material for the support could be Quartz, alumina, silicon carbide or zirconia. Examiner also states that Arakawa discloses an optional transparent glass protective film deposited on the support, which serves to form an airtight seal over the support frame.

Our Comments

In order to establish a *prima facie* case of obviousness, three criteria must be met: (i) there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference; (ii) there must be a reasonable expectation of success; and (iii) the prior art reference (or references when combined) must teach or suggest all the claim limitations. *See* MPEP § 2143.

Applicant assert that neither Arakawa, Tsuchino, nor a combination of the two suggest all of the limitations in Applicant's claims.

Claim 1 of the present application recites a method of preparing a stimulable phosphor sheet by electron beam deposition in which a stimulable phosphor source such as in the form of a pellet (see claim 3) has a high relative density (80-98%). Arakawa discloses, at column 10, lines 57-60, a deposited film of stimulable phosphor (i.e. phosphor layer) that has a relative density of not less than 70%. Further, Table 1 in Arakawa indicates that the relative density of the phosphor layer is 75%, 88%, or 93%. *See* Table 1, column 15, line 57, through column 16, line 8.

Therefore, Applicant's present claim 1 is patentably distinct because claim 1 recites the relative density of the vaporizing source, whereas Arakawa teaches the relative density of the phosphor layer produced on a support.

Furthermore, the Applicant's examples demonstrate the criticality of the claimed range of densities for the vaporizing source. Example 1 employs, as the vaporizing source, a pellet of relative density of 81% (*see* page 16, line 15), Example 3 employs a pellet of relative density of 80% (*see* page 17, lines 18-19), Example 4 employs a pellet of relative density of 95% (page 17, lines 25-26), and Comparison Example 6 employs a pellet with a relative density of 68% (*see* page 18, lines 24-25). Table 1 (*see* pages 19-20) indicates that each of the phosphor layers produced in Examples 1, 3, and 4 has columnar crystals in good condition, as well as deposited phosphor layers of good quality. Conversely, Example 6 has columnar crystals and a deposited phosphor layer of poor quality.

Claims 4, 6, 7, 11, 13, and 20 define a method for preparing a stimulable phosphor sheet by electron beam deposition wherein the electron beam is applied at an accelerating voltage in the range of 1.5 kV to 5.0 kV.

Examiner indicates that Tsuchino discloses an electron beam heating method. Examiner states that the accelerating voltage constitutes only a matter of design choice.

The range of accelerating voltage recited in the claims is critical and achieves an unexpected results with respect to the prior art. *See In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990). The Examples presented in Applicant's specification demonstrate that the accelerating voltage must be within a specific range to ensure good conditions for the deposited phosphor layer. Example 1 in Applicant's specification employs an accelerating voltage of 2.3

kV (page 16, lines 23-24), Example 2 employs 4.0 kV (page 17, line 9), Comparison Example 1 employs a 10.0 kV (page 17, line 31), and Comparison Example 2 employs 6.0 kV. Table 1 on pages 19-20 indicates that each of the phosphor layers produced in Examples 1 and 2 has columnar crystals of good condition and a deposited phosphor layer of good condition, while, in Comparison Example 1, a satisfactory phosphor layer is not produced, and the phosphor layer produced in Comparison Example 2 has relatively poor alignment of columnar crystals.

Claim 9 defines a method of preparing a stimulable phosphor sheet by electronic beam deposition in which the support of the sheet is gradually cooled after the deposition.

Arakawa teaches that the deposition is carried out by heating the substrate to a pre-determined temperature prior to heating the molybdenum boat (see column 10, lines 34-36). Note that Arakawa does not completely describe the cooling conditions after the substrate is heated.

Because Arakawa is silent with respect to the substrate's cooling conditions during deposition, claim 9 is not obvious. Applicant's Examples 5 and 6 illustrate how the cooling of the substrate during deposition is critical to the conditions of the resulting phosphor layer.

Claim 15 defines a stimulable phosphor sheet having a specific structure that prevents the deposited stimulable phosphor layer from deterioration caused by contact with the atmosphere.

Examiner states that the support could be quartz, alumina, silicon carbide, or zirconia. Examiner also states that a transparent glass protective film (layer) is also deposited on the substrate in order to create an airtight seal over the substrate frame.

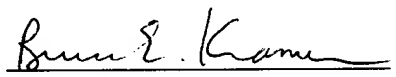
Applicant wishes to point out that Arakawa does not disclose that the transparent glass protective film is also deposited on the substrate to create an airtight seal.

The claimed "air tight seal" of claim 15 is critical to the quality of the invention. Example 1 embodies claim 15 and illustrates columnar crystals of the deposited phosphor layer that are in excellent conditions. Applicant's Examples 7 to 9 illustrate phosphor layers produced on a conventional quartz sheet, which are inferior to Applicant's Example 1.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

The claims are amended as follows:

18. (Amended) The stimulable phosphor sheet [method] of claim 15, wherein the stimulable phosphor is a stimulable alkali metal halide phosphor having an essential composition of the formula (1):

$$M^{I}X \cdot aM^{II}X'_2 \cdot bM^{III}X''_3 : zA \qquad (I)$$

in which M^{I} represents at least one alkali metal selected from the group consisting of Li, Na, K, Rb and Cs; M^{II} represents at least one divalent metal selected from the group consisting of Be, Mg, Ca, Sr, Ba, Ni, Cu, Zn and Cd; M^{III} represents at least one trivalent metal selected from the group consisting of Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Al, Ga and In; each of X, X', and X" independently represents at least one halogen atom selected from the group consisting of F, Cl, Br and I; A represents at least one metal selected from the group consisting of Y, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Na, Mg, Cu, Ag, Tl and Bi; and each of a, b and z is a number respectively satisfying the conditions of $0 \leq a < 0.5$, $0 \leq b < 0.5$, $0 \leq z < 0.2$.